

Accepted Manuscript

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Author: Gabriella Garbarino Sahar Chitsazan Thanh Khoa Phung Paola Riani Guido Busca



PII: S0926-860X(15)30068-5
DOI: <http://dx.doi.org/doi:10.1016/j.apcata.2015.07.017>
Reference: APCATA 15466

To appear in: *Applied Catalysis A: General*

Received date: 29-5-2015
Revised date: 7-7-2015
Accepted date: 8-7-2015

Please cite this article as: Gabriella Garbarino, Sahar Chitsazan, Thanh Khoa Phung, Paola Riani, Guido Busca, Preparation of supported catalysts: a study of the effect of small amounts of silica on Ni/Al₂O₃ catalysts, Applied Catalysis A, General <http://dx.doi.org/10.1016/j.apcata.2015.07.017>

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Preparation of supported catalysts: a study of the effect of small amounts of silica on Ni/Al₂O₃ catalysts

Gabriella Garbarino¹, Sahar Chitsazan¹, Thanh Khoa Phung^{1,2}, Paola Riani³, and Guido Busca^{1*}

1 Università degli Studi di Genova, Dipartimento di Ingegneria Civile, Chimica e Ambientale (DICCA), P.zzale Kennedy, 1 16129 Genova, Italy

2 NTT Institute of Hi-Technology (NIH), Nguyen Tat Thanh University, 298-300A Nguyen Tat Thanh Street, Ward 13, District 4, Ho Chi Minh City, Vietnam

3 Università degli Studi di Genova, Dipartimento di Chimica e Chimica Industriale (DCCI), Via Dodecaneso, 31 16146 Genova, Italy

*phone +390103536024; fax +390103536028; e-mail: Guido.Busca@unige.it

Keywords: Nickel catalysts; alumina support; silica-doped alumina; reducibility of Ni <ABS-Highlights

HEAD>catalysts; ethanol steam reforming; supported catalysts.

Highlights Ni/Al₂O₃ and Ni on 5% SiO₂/Al₂O₃ have been prepared and characterized. Highly dispersed Ni²⁺ ions, Ni-aluminate defective spinel and NiO particles form. SiO₂ shifts Ni to less reactive sites where the Ni-alumina interaction is weaker. The addition of silica to alumina produce more easily reducible Ni catalysts SiO₂-containing Ni/Al₂O₃ become active in Ethanol Steam Reforming at lower T.

Abstract. Nickel catalysts supported on pure alumina (Puralox) and 5% silica-containing alumina (Siralox) have been prepared, characterized (XRD, UV-vis-NIR, IR, H₂-TPR and FE-SEM) and tested. It is confirmed that small amounts of silica hinder the surface area loss of alumina upon calcination, allowing the retention of higher surface areas also when NiO is deposited on the support. Depending on the Ni loading, calcination temperature and on the presence/absence of silica, several species of Ni²⁺ form on the catalyst: highly dispersed ions, Ni-aluminate defective spinel species and NiO particles. The presence of 5% silica hinders the dispersion of Ni²⁺ ions and the formation of Ni aluminate phase, and favours the formation of the NiO phase. This is attributed to the competition of silica and nickel oxide for interaction on the most reactive surface sites of alumina. Silica shifts Ni species to less reactive sites where the Ni-alumina interaction is weaker. As result of this,

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